PHOTOFACT® Folder

HARPERS
MODEL NL-404

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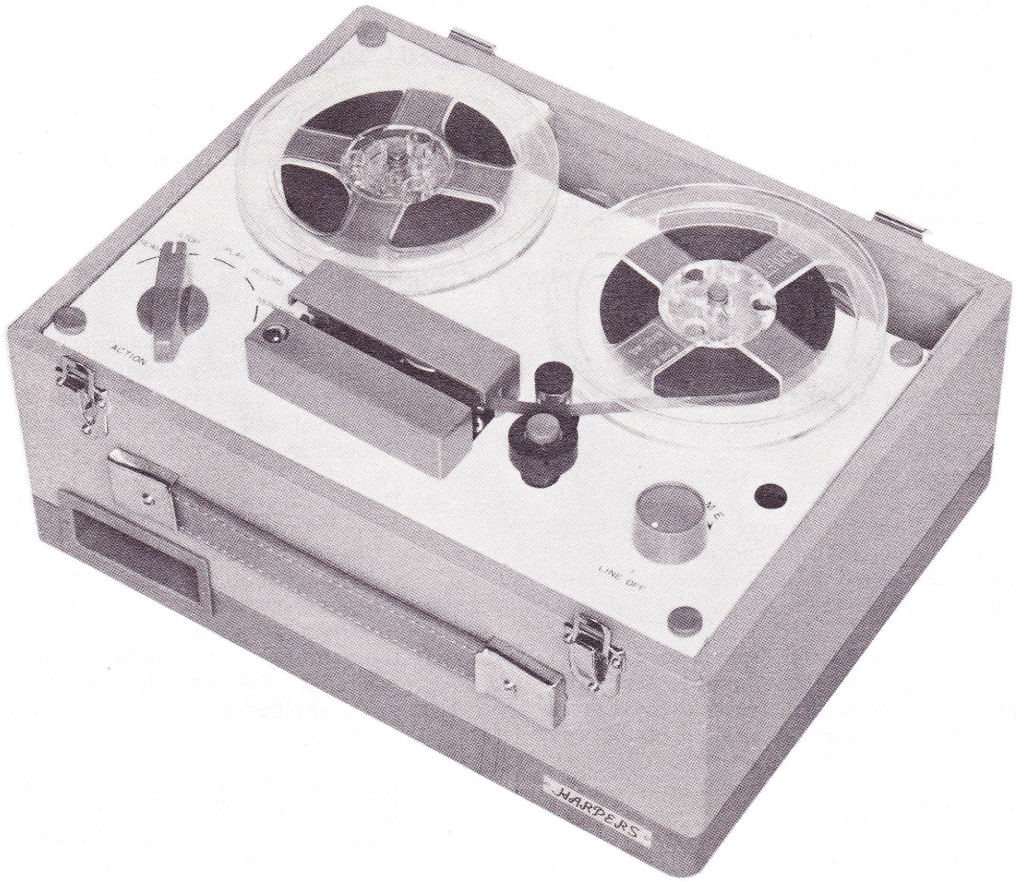

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GENERAL INFORMATION

The Harpers Model NL-404 is a two-speed tape recorder designed to play and record two tracks of material on standard-width recording tape.

Recordings can be made from a phonograph, radio, television receiver, or directly from the microphone.

The two speeds are 7 1/2 and 3 3/4 ips. Using both tracks, the recording times are as follows:

Reel Size	3 3/4 ips	7 1/2 ips
5" (600 ft.)	1 hour	1/2 hour

Model NL-404 is designed to operate on 60 cycles, 110-120 volts, AC supply only.

Supplied By:

Harpers International, Inc.
315 Fifth Avenue
New York 16, New York

HOWARD W. SAMS & CO., INC. Indianapolis 6, Indiana

FUNCTION OF CONTROLS

On-Off-Volume (Line Off)

Turn knob clockwise to turn the power on to the unit. Further rotation clockwise increases the volume.

Selector (Action)

Selects the different modes of operation. Turning control in a counterclockwise direction from the Stop position, places the unit in the Rewind mode. Turning control clockwise one position from the Stop position, places the unit in Play mode; the second position is for Record, and the third position for Monitor.

Speed Change

With the brass bushing on capstan (26) the speed of the tape is 7 1/2 ips. To change speed to 3 3/4 ips, remove thumb screw (27) from the capstan and remove brass bushing.

OPERATING INSTRUCTIONS

Threading the Tape

1. Place a full reel of tape on supply reel stand (36).
2. Place an empty reel on take-up reel stand (7).
3. Unwind about 10 inches of tape from the supply reel. Hold a section taut and insert it in the tape slot. Make sure the dull-coated side faces the rear of the recorder.
4. Insert the free end of the tape into one of the radial slots in the hub of the take-up reel. Turn the reel several turns counterclockwise to fasten the tape to the reel and take up all slack between reels.

To Record from Microphone

1. Rotate the On-Off-Volume control clockwise to turn the recorder on. Allow sufficient time for tubes to warm up.
2. Insert the microphone plug into the "Mike" jack.
3. Set the speed for the desired speed.
4. Turn the Selector knob to the record position.
5. Hold the microphone about 6 to 12 inches from your mouth and speak in a normal voice.
6. Adjust the volume control until the record level indicator flashes on the loudest passages.

NOTE: Correct volume level is very important. Too weak a signal will result in weak playback and high background noise. Too strong a signal will result in distortion during playback.

Recording Radio Programs

Radio programs may be recorded by one of the following methods:

1. Using Radio Tuner — Connect the output of the tuner to the "Mike" jack and turn the Selector knob to "Record" position. The program can be monitored while recording, by turning the selector knob to the "Monitor" position.
2. Microphone Pickup from Speaker of Radio — Place the microphone about 6 to 12 inches in front of the radio speaker. Turn the radio volume control to a normal level. Turn the radio tone control to treble or high. Set the recording level and record as described under "To Record from Microphone".
3. Direct Connection to Radio Speaker — Make a shielded cable with a two-conductor phone plug on one end and two alligator clips on the other end. Connect the alligator clips across the voice-coil terminals of the radio speaker and insert the phone plug into the "Mike" jack. Set the radio volume and tone controls as described in Step 2. Set the recording level and proceed as described under "To Record from Microphone".
4. Direct Connection to Volume Control of Radio — Make a shielded cable with a two-conductor phone plug on one end. Connect the other end across the radio volume control. Insert the phone plug into the "Mike" jack. Set the recording level and proceed as described under "To Record from Microphone". The setting of the radio volume and tone controls will have no effect on this setup.

To Record from Phonograph

A phono-type plug is required on the pick-up leads. Insert it into the "Mike" jack and proceed as described under "To Record from Microphone".

To Record from a Television Receiver

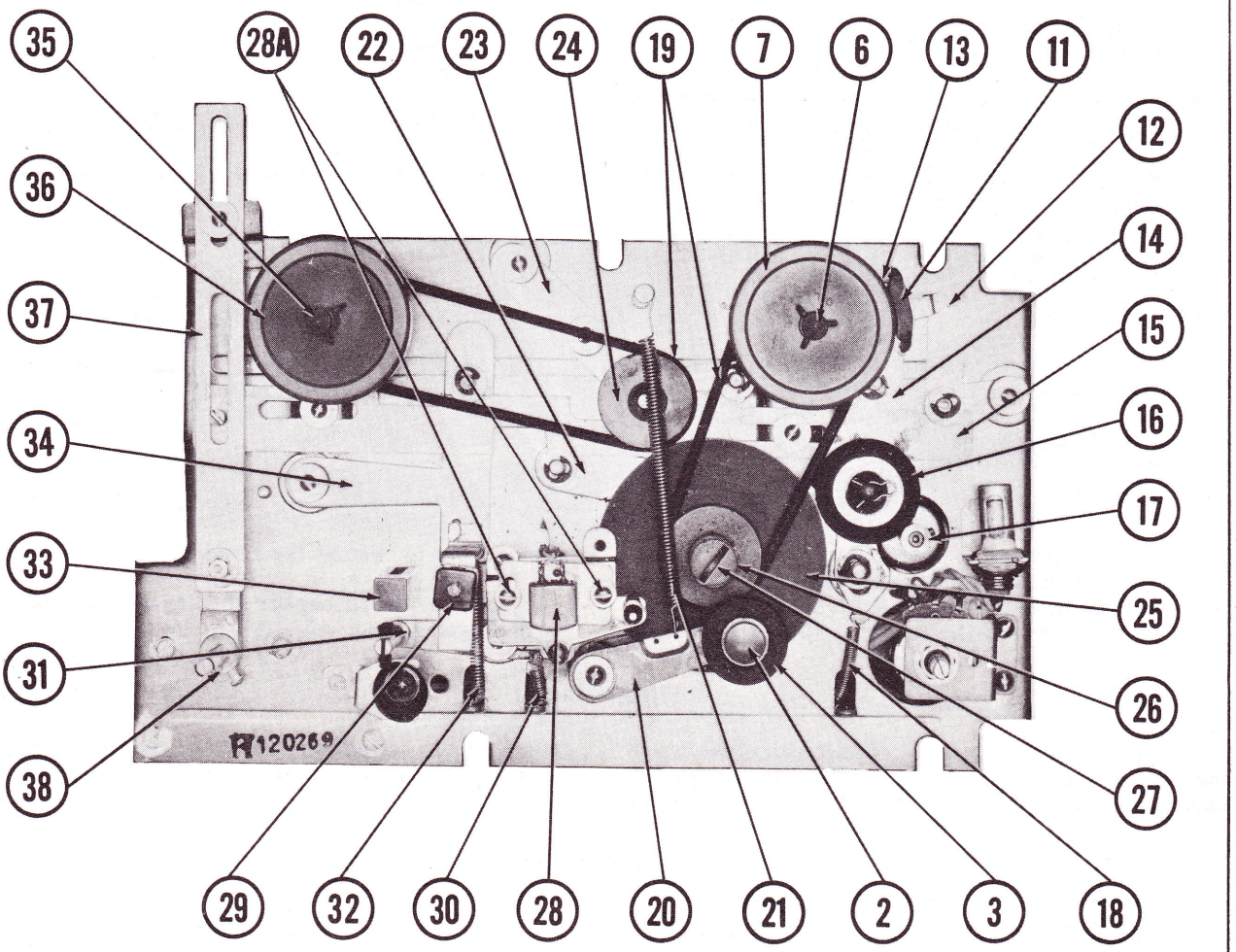
Use method 2, 3, or 4 as described under "Recording Radio Programs".

Dual Track Recording

This recorder is designed to record and play on one-half of the tape at a time; thereby, resulting in two-track recording. After the first recording is completed, remove the full reel from the take-up reel stand (7), turn the reel over and place it on the supply reel stand (36). Then make another recording. The tape can be played back in the same manner.

Rewind

To rewind the tape at a rapid speed, turn the selector knob to Rewind position.



TOP VIEW OF MECHANISM

To Play a Recording

1. Thread the tape as described under "Threading the Tape".
2. Turn Selector knob to Play position.
3. Adjust the Volume control to the desired listening level.

Using Recorder as an Amplifier for a Radio Tuner

1. To use the recorder as an amplifier, connect the output of the tuner into the Tuner jack.
2. Leave the Selector knob in the "Stop" position.
3. Adjust the volume to the desired listening level.
4. Tune in the desired station.

To Erase a Recording

Any recording on the tape is automatically erased before a new recording is made. To erase a recording without recording new material, follow the normal recording procedure but set the volume control to the full counterclockwise position.

To Edit and Splice Tape

NOTE: It is impossible to edit and splice one track without affecting the other. Recordings to be edited should be limited to one track.

1. Tape may be edited by cutting out unwanted portions, or by jamming selections into another sequence. Announcements can be inserted between selections, etc. Unused tape can be spliced for reuse.
2. For best results, cut tape at a slight diagonal, butt ends together and fasten on the glossy side with splicing tape. Trim off any excessive width.

DISASSEMBLY

To Remove Mechanism from the Case

1. Remove the Selector and On-Off-Volume control knobs.
2. Remove thumb screw from the pressure roller and remove pressure roller.
3. Remove the four thumb screws from the top plate and remove top plate.
4. Remove the five hex nuts holding mechanism in the case.
5. Lift mechanism up and unsolder the speaker leads.
6. Lift the mechanism from the case.
7. To reassemble, reverse the foregoing procedure.

ADJUSTMENTS

Record-Playback Head

1. Thread a prerecorded 5,000-cycle note tape onto the recorder.
2. Place the recorder in the Playback mode.
3. Set Volume control to the center of its range.
4. Adjust screws (28A) for the angular position that will give maximum output.

CLEANING

The record head, erase head, capstan, pressure roller, and tape guides should be cleaned occasionally to remove the tape residue which is worn off the tape as it passes these parts. Use a soft cloth and alcohol to remove the residue.

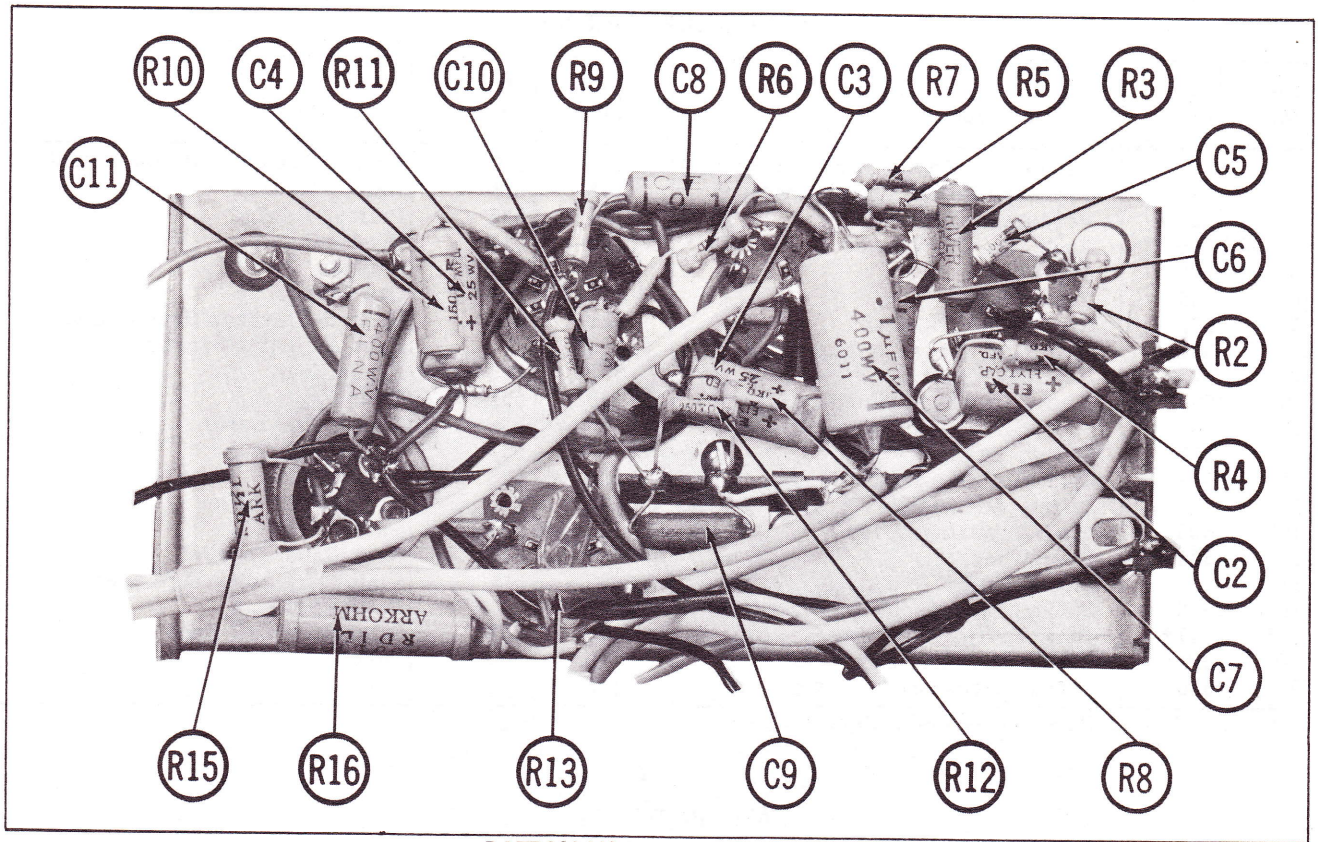
Clean the rubber-tired idler wheels and belts with cleaning fluid.

LUBRICATION

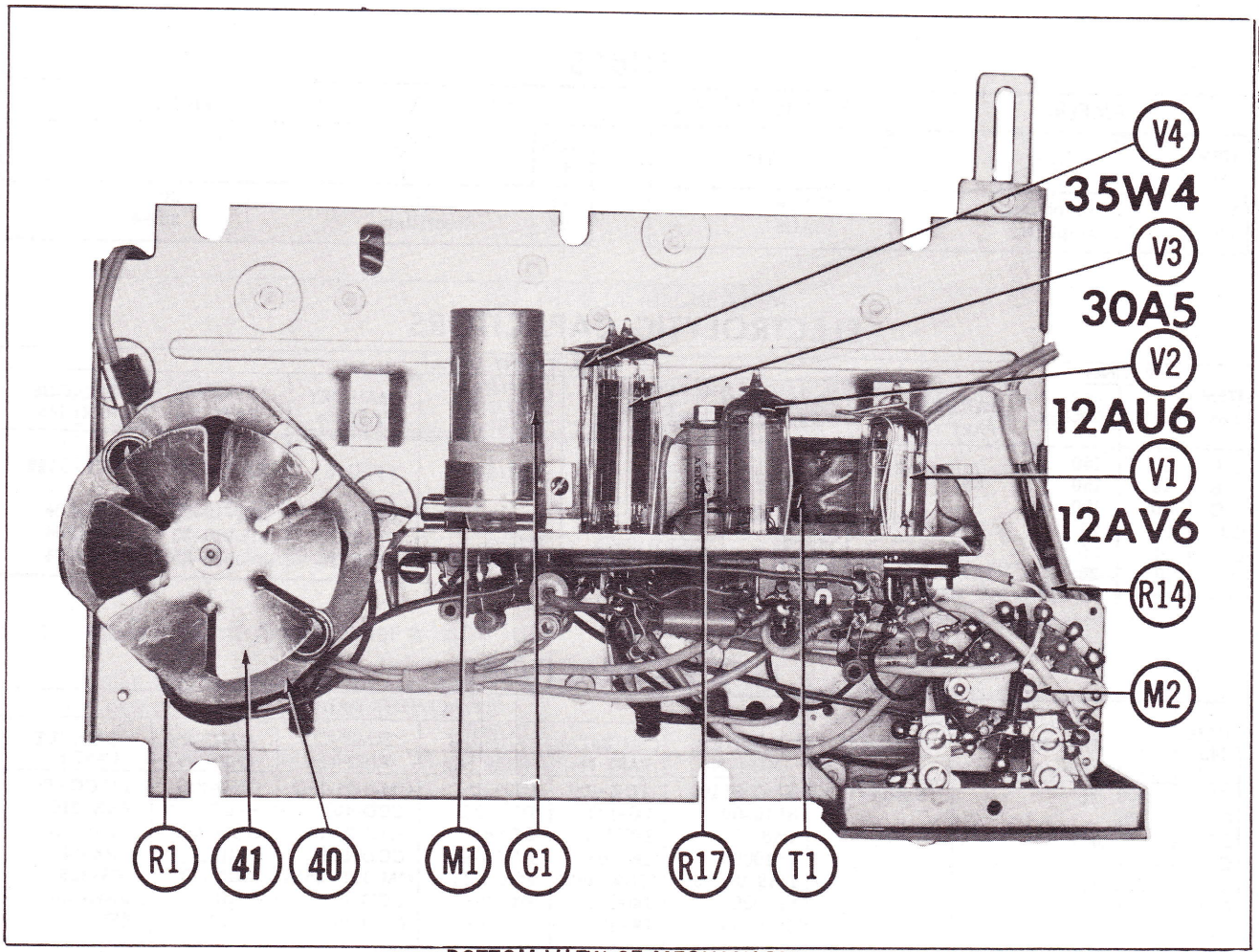
All rotating parts are provided with oilite bearings and are lubricated at the factory. Under normal use, no lubrication is required for a long period of time. When lubrication becomes necessary, apply a thin film of oil on bearing surfaces.

TROUBLE CHART

Symptom	Cause	Remedy
No Rewind.	1. Rewind belt (19) disconnected or broken. 2. Drive belt (19) broken. 3. Rewind lever (23) misadjusted. 4. Motor idler spring (18) disconnected or broken.	1. Connect or replace rewind belt (19). 2. Replace drive belt (19). 3. Adjust rewind lever (23). 4. Connect or replace motor idler spring (18).
No Record.	1. Drive belt (19) broken. 2. Motor idler spring (18) disconnected or broken. 3. Defective Record-Playback head (28).	1. Replace drive belt (19). 2. Connect or replace motor idler spring (18). 3. Replace Record-Playback head (28).
No Erase.	1. Spring (32) disconnected or broken. 2. Defective erase head (29).	1. Connect or replace spring (32). 2. Replace erase head (29).
No drive in Play or Record position.	1. Drive belt (19) broken. 2. Motor idler spring (18) disconnected or broken. 3. Pressure roller spring (21) disconnected or broken. 4. Motor (40) defective. 5. On-Off switch defective.	1. Replace drive belt (19). 2. Connect or replace motor idler spring (18). 3. Connect or replace pressure roller spring (21). 4. Replace motor (40). 5. Replace On-Off switch.



BOTTOM VIEW OF AMPLIFIER



BOTTOM VIEW OF MECHANISM

MECHANICAL PARTS LIST

Ref. No.	Part No.	Description
1		Escutcheon Thumb Screw (4 Req'd.)
2	537	Pressure Roller Thumb Screw
3	539	Pressure Roller
4	505	Knob, On-Off-Volume
5	502	Top Plate
6	536	Thumb Screw
7	531	Reel Stand, Take-up
8	561	Felt Ring, Take-up Reel Stand
9	533	Friction Wheel
10	534	Sleeve, Friction Wheel
11	541	Shoe, Brake
12	517	Lever, Brake
13	549	Spring, Brake Lever
14	511	Lever, Motor Idler
15	509	Main Actuating Lever
16	538	Idler Wheel
17		Motor Pulley
18	548	Spring, Motor Idler Lever
19*	547*	* Belt, Drive, Rewind (2 Req'd.)
20	519	Pressure Roller Lever
21	550	Spring, Pressure Roller Lever

* Belt, Drive, Rewind, WALSCO Part No. 1474

Ref. No.	Part No.	Description
22	514	Lever, Pressure Roller Actuating
23	512	Lever, Rewind
24	535	Pulley, Rewind
25	543	Flywheel
26		Capstan
27		Cap Screw
28	544	Record-Playback Head Ass'y.
28A		Head Adjusting Screws
29	546	Erase Head
30	551	Spring
31	516	Tape Guide Lever
32	553	Spring
33	523	Tape Guide
34		Erase Head Lever
35	536	Thumb Screw
36	532	Reel Stand, Rewind
37	513	Plate Cam Actuating Lever
38		Plate Cam
39	503	Selector Switch Knob
40	540	Motor
41		Fan

AMP PARTS LIST

TUBES

AMPEREX - GENERAL ELECTRIC - RAYTHEON - SYLVANIA

ITEM No.	USE	TYPE
V1	AF Amplifier	12AV6
V2	AF Amplifier	12AU6
V3	Output	30A5
V4	Rectifier	35W4

ELECTROLYTIC CAPACITORS

ITEM No.	RATING		REPLACEMENT DATA						
	CAP.	VOLT.	HARPERS PART No.	AEROVOX PART No.	CORNELL-DUBILIER PART No.	GENERAL ELECTRIC PART No.	MALLORY PART No.	PYRAMID PART No.	SPRAGUE PART No.
C1A	40	150	631	AFH3-10	C0090	XC3-38	FP311.5	TMT-3127	TVL-3442
B	40	150							
C	40	150							
C2	10	25	632	PTT79	NLW10-25	MT1-5	TT25X10	MLV10-25	TE-1204
C3	10	25	632	PTT79	NLW10-25	MT1-5	TT25X10	MLV10-25	TE-1204
C4	10	25	632	PTT79	NLW10-25	MT1-5	TT25X10	MLV10-25	TE-1204

FIXED CAPACITORS

ITEM No.	RATING	REMARKS	REPLACEMENT DATA					
			AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	ELMENCO PART No.	MALLORY PART No.	SPRAGUE PART No.
C5	100 5%	Note 1	NPO-SI 100	TCZ-100	C10T1C	CM-19B-101J	CNO-310	10TCC-T10
C6	.01		SI 10000	D6-103	BYA10S1	CCD-103	B-110	5HK-S10
C7	.1 400V		P488N-1	DF-104	CUB4P1	4DP-3-104	GEM-401	4TM-P10
C8	.01		SI 10000	D6-103	BYA10S1	CCD-103	B-110	5HK-S10
C9	250 10%		1469-00025	TCZ-240	22R5T25	CM-19B-251K	MCB240	MS-325
C10	.01		SI 10000	D6-103	BYA10S1	CCD-103	B-110	5HK-S10
C11	.01		SI 10000	D6-103	BYA10S1	CCD-103	B-110	5HK-S10

Note 1. Not used in some versions.

CONTROLS

All wattages 1/2 watt, or less, unless otherwise listed.

ITEM No.	USE	RESISTANCE	REPLACEMENT DATA				
			HARPERS PART No.	CENTRALAB PART No.	CLAROSTAT PART No.	CTS-IRC PART No.	MALLORY PART No.
R1	Volume & Switch	500K	638	B-60, KR-1 (AB-60, KR-1, AK-11, B-60-S)	A47-500K-Z/ SWE-12, KSS-3	Q13-133, 76-1, (BU1, CF25, SS1, GC)*	U48, US-26, (UA55A, US-41, SK-1000)

* "SNAPTROL"

RESISTORS

All wattages 1/2 watt, or less, unless otherwise listed.

ITEM No.	RATING	REPLACEMENT DATA		
		IRC PART No.	WORKMAN PART No.	REMARKS
R2	500K			
R3	250K			
R4	5000Ω			
R5	100K			
R6	2meg			
R7	300K			
R8	3000Ω			
R9	500K			

ITEM No.	RATING	REPLACEMENT DATA		
		IRC PART No.	WORKMAN PART No.	REMARKS
R10	150Ω			
R11	250K			
R12	250K			
R13	50K			
R14	3Ω 1W			
R15	10K			(20K)*
R16	200Ω 1W			
R17	100Ω 3W	PW5-100	3W-SQ-100	

* Alternate Value.

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	IMPEDANCE		REPLACEMENT DATA					NOTES
	PRI.	SEC.	HARPERS PART No.	Merit PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.	
T1	2700Ω	3-4Ω	602	A-3025①	A-3332①	24S53①	S-12X①	① Drill New Mounting Hole(s)

SPEAKER

ITEM No.	TYPE			REPLACEMENT DATA		NOTES
	SIZE	FIELD	V. C. IMP.	HARPERS PART No.	QUAM PART No.	
SP1	4"	PM	3-4Ω	PM-4	4A07	

FUSES

ITEM No.	TYPE	RATING	REPLACEMENT DATA					
			HARPERS PART No.		LITTELFUSE PART No.		BUSS PART No.	
			FUSE	HOLDER	FUSE	HOLDER	FUSE	HOLDER
M1	3AG	1A 250V	613	612	312001 (3AG 1A 250V)	353001	AGC 1	4405

MISCELLANEOUS

ITEM No.	PART NAME	HARPERS PART No.	NOTES
M2	Switch		Function (Rotary Wafer Type)

WIRING DATA

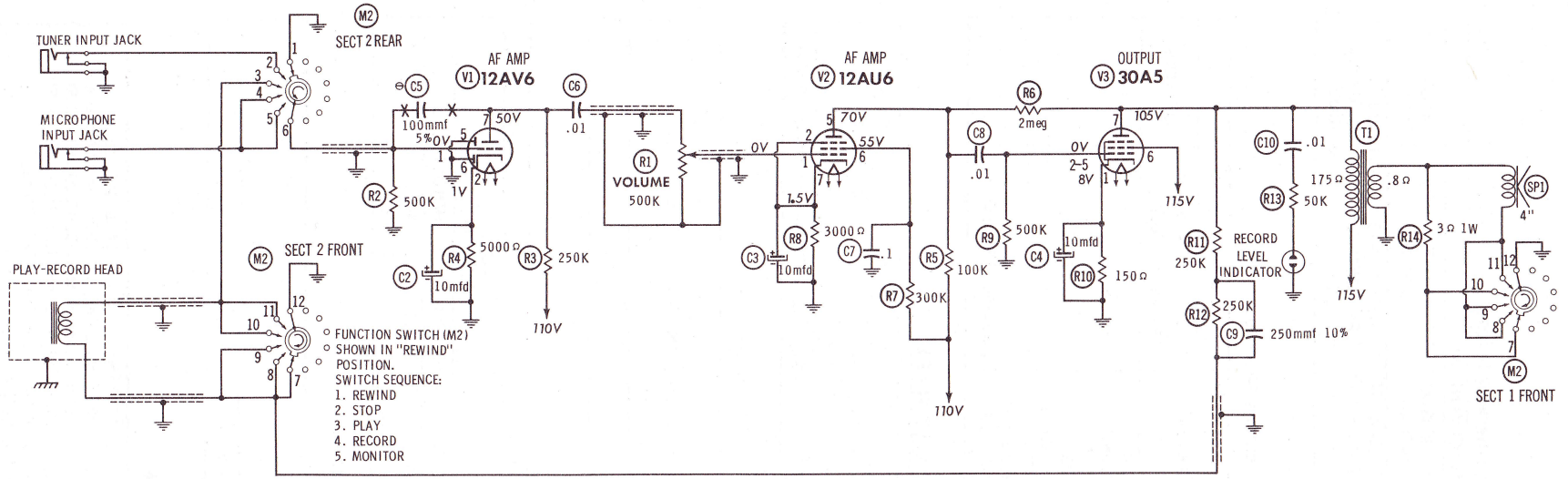
General-use Unshielded Hook-up Wire ..... Use BELDEN No. 8530 (Solid) Available in 12 Colors
8524 (Stranded) Available in 12 Colors

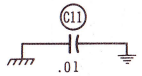
Power Cord ..... Use BELDEN No. 17106 (Plastic) or 17126 (Rubber) - 6 Ft.
17109 (Plastic) or 17129 (Rubber) - 9 Ft.

Power Cord (Interlock Type) ..... Use BELDEN No. 8874 (Rubber) or 8895 (Plastic)

Low-Loss Shielded Lead (Interconnecting) ..... Use BELDEN No. 8401 or 8421

Phono Pick-up Arm Cable ..... Use BELDEN No. 8430 (Two Conductor-Unshielded)
8429 (Two Conductor-Shielded)
8419 (Three Conductor-Shielded)



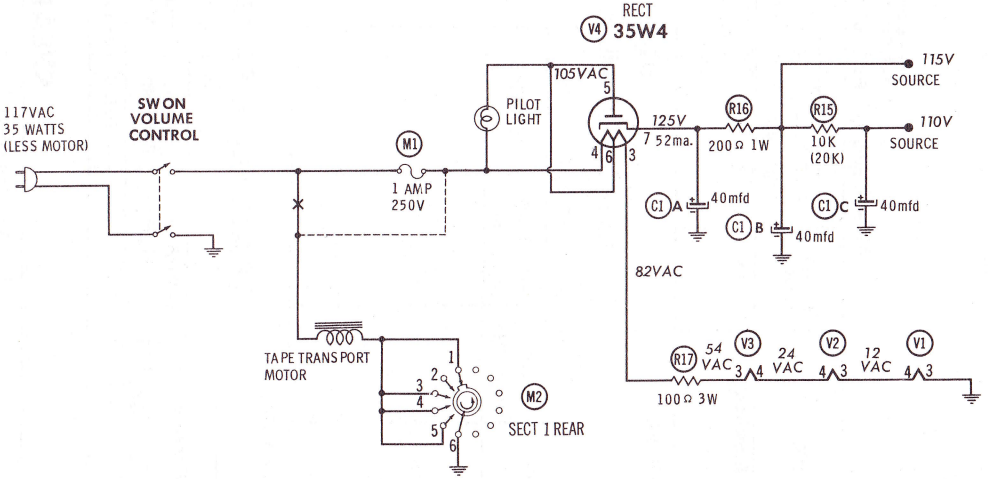


NUMBERS ASSIGNED TO COILS, SWITCHES, PLUGS, SOCKETS, AND TRANSFORMERS ARE TO FACILITATE CIRCUIT TRACING OR COMPONENT REPLACEMENT AND MAY NOT NECESSARILY BE FOUND ON THE UNIT.

RESISTANCE READINGS

ITEM	TUBE	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7
V1	12AV6	■0Ω 650Ω	5K	0Ω	12Ω	0Ω	0Ω	†270K
V2	12AU6	0Ω	3K	12Ω	24Ω	†120K	†320K	3K
V3	30A5	150Ω	500K	54Ω	24Ω	500K	†200Ω	
V4	35W4	TP	NC	154Ω	179Ω	179Ω	179Ω	¶

ALL MEASUREMENTS TAKEN IN "PLAY" POSITION UNLESS OTHERWISE DESIGNATED.
■ MEASURED IN "RECORD" POSITION.
† MEASURED FROM PIN 7 OF V4.
¶ THIS READING WILL VARY DEPENDING UPON THE CONDITION OF THE ELECTROLYTIC IN THE CIRCUIT.
NC NO CONNECTION
TP TIE POINT



⊖ SEE PARTS LIST FOR ALTERNATE VALUE OR APPLICATION

1. DC voltage measurements taken with vacuum tube voltmeter; AC voltages measured with 1000 ohm per volt voltmeter.
2. Socket connections are shown as bottom views.
3. Measured values are from socket pin to common ground.
4. Line voltage maintained at 117 volts for voltage readings.
5. Nominal tolerance of component values makes possible a variation of ±15% in voltage and resistance readings.
6. All controls at minimum, proper output load connected.

A PHOTOFACT STANDARD NOTATION SCHEMATIC

HARPERS MODEL NL-404